Stream: HANGING ROCK CRK. Reach: Cross Section: # 1 Date: 10/6/04 Crew: JSF, LET, JTL, MLM

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	1.0	VERY LOW
2.7'	2.7'	1.0		
Root Depth/Bank Height				
* Root Depth (ft) C	C/A		10	EXTREME
0'	0			
Weighted Root Density				
* Root Density (%) D	D*(C/A)		10	EXTREME
0%	0			
Bank Angle				
Bank Angle (degrees)			3.0	LOW
30°				
Surface Protection				
Surface Protection (%)			10	EXTREME
0%				
Materials: LOOSE GRAVEL/SAND			+8	
Stratification: NONE			+0	
TOTAL SCORE:			42	V. High

Bank Erosion Hazard Index

Erodibility Variable		Bank Erosion Potential					
		Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
Bank Height/ Bankfull Height	Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height	Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle	Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)
Boulders (Banks composed of boulders have low bank erosion potential)
Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)
Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)
Sand (Add 10 points)
Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

* BANKS WERE NEWLY CONSTRUCTED & OVERLAIN WITH MATTING. ONCE VEGETATION ESTABLISHES BEHI WILL DROP TO LOW.

Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
1.5	0.0094	62.4	0.88
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
2.7	0.0094	62.4	1.58
d_{maxnb}	S_{nb}	γ	τ_{nb}

Near Bank Stress = $\frac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)}$ = 1.80

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
MODERATE	VERY HIGH

Bank Erosion Prediction (ft/yr)	0.3

Circle Curve Used:

Yellowstone
(Colorado)
Other

Stream: HANGING ROCK CRK. Reach: Cross Section: # 2 Date: 10/6/04 Crew: MULKEY

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	3.9	LOW
7.4'	6.2'	1.19		
Root Depth/Bank Height				
* Root Depth (ft) C	C/A		10	EXTREME
0%	0			
Weighted Root Density				
* Root Density (%) D	D*(C/A)		10	EXTREME
0%	0			
Bank Angle				
Bank Angle (degrees)			3.2	LOW
45°				
Surface Protection				
* Surface Protection (%)			10	EXTREME
0%				
Materials: ROOT WADS W/ GRAVEL			+5	
Stratification: NONE			0	
TOTAL SCORE:			42.1	V. High

Bank Erosion Hazard Index

Erodibility Variable			Bank Erosion Potential: Very Low	Low	Moderate	High	Very High	Extreme
Bank Height/ Bankfull Height		Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height		Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density		Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle		Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection		Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)
Boulders (Banks composed of boulders have low bank erosion potential)
Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)
Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)
Sand (Add 10 points)
Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	Low	Moderate	High	Very High	Extreme
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

* BANKS NEWLY CONSTRUCTED VEGETATION NOT YET ESTABLISHED.

Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
2.8	.00016	62.4	0.020 ~~0.25~~
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
6.2	.00016	62.4	0.062
d_{maxnb}	S_{nb}	γ	τ_{nb}

Near Bank Stress = $\dfrac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)}$ = 3.1

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
VERY HIGH	VERY HIGH

Bank Erosion Prediction (ft/yr)	0.8

Circle Curve Used:

Yellowstone
(Colorado)
Other

Stream: HANGING ROCK CRK Reach: Cross Section: # 3 Date: 10/6/04 Crew: MULKEY

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	1.0	VERY LOW
2.2	2.2	1.0		
Root Depth/Bank Height				
* Root Depth (ft) C	C/A		10	EXTREME
0'	0			
Weighted Root Density				
* Root Density (%) D	D*(C/A)		10	EXTREME
0%	0			
Bank Angle				
Bank Angle (degrees)			2.5	LOW
30°				
Surface Protection				
* Surface Protection (%)			10	EXTREME
0%				
Materials: LOOSE GRAVEL/SAND			+ 10	
Stratification: NONE			0	
TOTAL SCORE:			43.5	V. HIGH

Bank Erosion Hazard Index

Erodibility Variable			Bank Erosion Potential					
			Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
Bank Height/ Bankfull Height	Value		1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
	Index		1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height	Value		1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
	Index		1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density	Value		100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
	Index		1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle	Value		0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
	Index		1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection	Value		100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
	Index		1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)
Boulders (Banks composed of boulders have low bank erosion potential)
Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)
Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)
Sand (Add 10 points)
Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

* NEWLY CONSTRUCTED BANKS, VEGETATION NOT YET ESTABLISHED.

Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
1.1	0.0217	62.4	1.49
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
2.9	0.0217	62.4	3.93
d_{maxnb}	S_{nb}	γ	τ_{nb}

Near Bank Stress = $\frac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)}$ = 2.63

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
VERY HIGH	VERY HIGH

Bank Erosion Prediction (ft/yr)	0.8

Circle Curve Used:

Yellowstone
Colorado
Other

Stream: HANGMAN CREEK Reach: Cross Section: #4 Date: 10/6/04 Crew: MULKEY

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	4.0	MOD.
4.66	3.9	1.20		
Root Depth/Bank Height				
Root Depth (ft) C	C/A		8.5	VERY HIGH
0.5	0.113			
Weighted Root Density				
Root Density (%) D	D*(C/A)		10	EXTREME
30	3.3			
Bank Angle				
Bank Angle (degrees)			3.3	LOW
47.3°				
Surface Protection				
Surface Protection (%)			7.2	HIGH
20				
Materials: GRAVEL/SAND			+7	
Stratification: NONE			+0	
TOTAL SCORE:			40	V. HIGH

Bank Erosion Hazard Index

Erodibility Variable		Bank Erosion Potential					
		Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
Bank Height/ Bankfull Height	Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height	Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle	Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)

Boulders (Banks composed of boulders have low bank erosion potential)

Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)

Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)

Sand (Add 10 points)

Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
2.0	0.0005	62.4	0.0624
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
3.9	0.0005	62.4	0.122
d_{maxnb}	S_{nb}	γ	τ_{nb}

Near Bank Stress = $\frac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)}$ = 1.95

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
MODERATE	VERY HIGH

Bank Erosion Prediction (ft/yr)	0.3

Circle Curve Used:

Yellowstone
(Colorado)
Other

Stream: HANGING ROCK CRK Reach: Cross Section: #5 Date: 10/6/04 Crew: MUCK & 4

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	5.0	MOD.
5.17	3.8	1.36		
Root Depth/Bank Height				
Root Depth (ft) C	C/A		7.5	HIGH
1.0	0.20			
Weighted Root Density				
Root Density (%) D	D*(C/A)		8.0	VERY HIGH
40%	14			
Bank Angle				
Bank Angle (degrees)			3.0	LOW
30.5°				
Surface Protection				
Surface Protection (%)			2.2	LOW
70%				
Materials: COBBLE/GRAVEL/SAND			+6	
Stratification: NONE			+0	
TOTAL SCORE:			31.7	HIGH

Bank Erosion Hazard Index

Erodibility Variable			Bank Erosion Potential					
			Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
Bank Height/ Bankfull Height		Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height		Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density		Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle		Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection		Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)

Boulders (Banks composed of boulders have low bank erosion potential)

Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)

Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)

Sand (Add 10 points)

Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
2.5	0.00063	62.4	0.0975
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
3.8	0.00063	62.4	0.148
d_{maxnb}	S_{nb}	γ	τ_{nb}

Near Bank Stress = $\dfrac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)}$ = 1.52

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
MODERATE	HIGH

Bank Erosion Prediction (ft/yr)	0.3

Circle Curve Used:

Yellowstone
(Colorado)
Other

Stream: HANGMAN CREEK Reach: Cross Section: # 6 Date: 10/6/04 Crew: MULKEY

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	2.5	LOW
2.15	1.9	1.13		
Root Depth/Bank Height				
Root Depth (ft) C	C/A		4.1	MOD
1.0'	0.47			
Weighted Root Density				
Root Density (%) D	D*(C/A)		5.0	MOD.
90%	42.3			
Bank Angle				
Bank Angle (degrees)			1.5	VERY LOW
11.4°				
Surface Protection				
Surface Protection (%)			1.5	VERY LOW
90%				
Materials: GRAVEL/SAND			+6	
Stratification: NONE			+0	
TOTAL SCORE:			20.6	MOD

Bank Erosion Hazard Index

Erodibility Variable		Bank Erosion Potential					
		Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
Bank Height/ Bankfull Height	Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
	Index	1.0 - 1.9	2.0 -3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height	Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle	Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)

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Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)

Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)

Sand (Add 10 points)

Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
1.0	0.0076	62.4	0.474
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
1.9	0.0076	62.4	0.901
d_{maxnb}	S_{nb}	γ	τ_{nb}

Near Bank Stress = $\dfrac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)}$ = 1.9

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
MODERATE	MODERATE

Bank Erosion Prediction (ft/yr)	0.2

Circle Curve Used:

Yellowstone
(Colorado)
Other

Stream: HANGING ROCK CRK Reach: Cross Section: #7 Date: 10/6/04 Crew: MULKEY

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	4.9	MOD.
2.4	1.7	1.41		
Root Depth/Bank Height				
Root Depth (ft) C	C/A		3.3	LOW
1.5'	0.625			
Weighted Root Density				
Root Density (%) D	D*(C/A)		3.8	LOW
90%	56.3			
Bank Angle				
Bank Angle (degrees)			1.8	VERY LOW
18.8°				
Surface Protection				
Surface Protection (%)			1.5	VERY LOW
90%				
Materials: GRAVEL/SAND			+ 5	
Stratification: NONE			+ 0	
TOTAL SCORE:			20.3	MOD.

Bank Erosion Hazard Index

Erodibility Variable			Bank Erosion Potential					
			Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
Bank Height/ Bankfull Height		Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height		Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density		Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle		Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection		Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)
Boulders (Banks composed of boulders have low bank erosion potential)
Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)
Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)
Sand (Add 10 points)
Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
1.3	0.0044	62.4	0.357
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
1.7	0.0044	62.4	0.467
d_{maxnb}	S_{nb}	γ	τ_{nb}

Near Bank Stress = $\dfrac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)}$ = 1.31

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
Low	Low/mod.

Bank Erosion Prediction (ft/yr)	0.09

Circle Curve Used:

Yellowstone
(Colorado)
Other

Stream: UT to Hanging Rock Cr. Reach: Cross Section: # 1 Date: 10/4/04 Crew: Mulkey

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	6.5	High
1.9	1.1	1.73		
Root Depth/Bank Height				
Root Depth (ft) C	C/A		3.7	Low
1.0	0.52			
Weighted Root Density				
Root Density (%) D	D*(C/A)		4.6	MOD.
90%	47.4			
Bank Angle				
Bank Angle (degrees)			2.7	Low
32°				
Surface Protection				
Surface Protection (%)			1.1	VERY LOW
95%				
Materials: GRAVEL/SAND (X-VANE)			+ 6	
Stratification: NONE			+ 0	
TOTAL SCORE:			24.6	MOD.

Bank Erosion Hazard Index

Erodibility Variable		Bank Erosion Potential					
		Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
Bank Height/ Bankfull Height	Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height	Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle	Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)

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Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)

Sand (Add 10 points)

Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
0.7	.011	62.4	0.48
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
1.1	.011	62.4	0.70
d_{maxnb}	S_{nb}	γ	τ_{nb}

Near Bank Stress = $\dfrac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)}$ = 1.58

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
MODERATE	MODERATE

Bank Erosion Prediction (ft/yr)	0.2

Circle Curve Used:

Yellowstone
(Colorado)
Other